

Supersonic Technology Development



**Gulfstream Aerospace Corporation
FAA Public Meeting – Supersonics
July 14, 2011 / Washington, DC**

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A GENERAL DYNAMICS COMPANY

Civil Supersonics / Concorde is Gone – What Now?

- **Gulfstream Perspective...
Quiet Supersonic Jet (QSJ)**

- **Different Market**

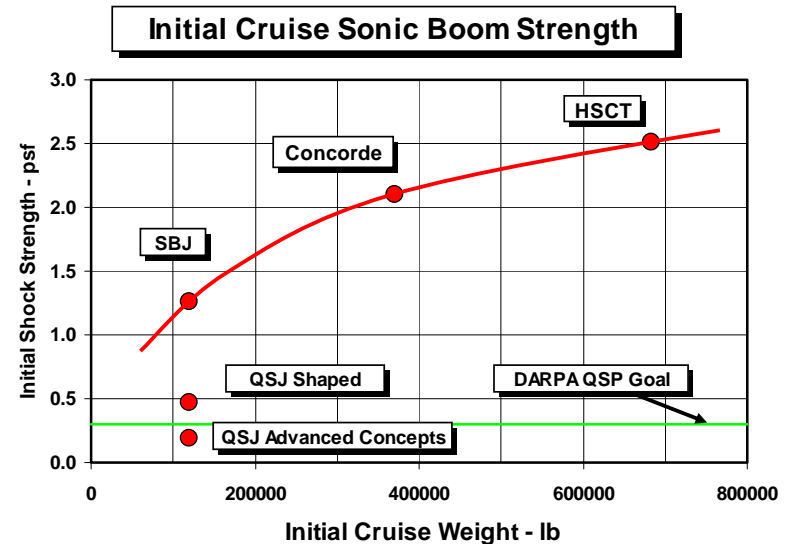
- **Business Jet: Speed is Important & Affordable**

- **Different Requirements**

- **High Speed Civil Transport: Mach 2.4, 600K airliner**
- **Quiet Supersonic Jet: Mach 1.8, 100K transport**

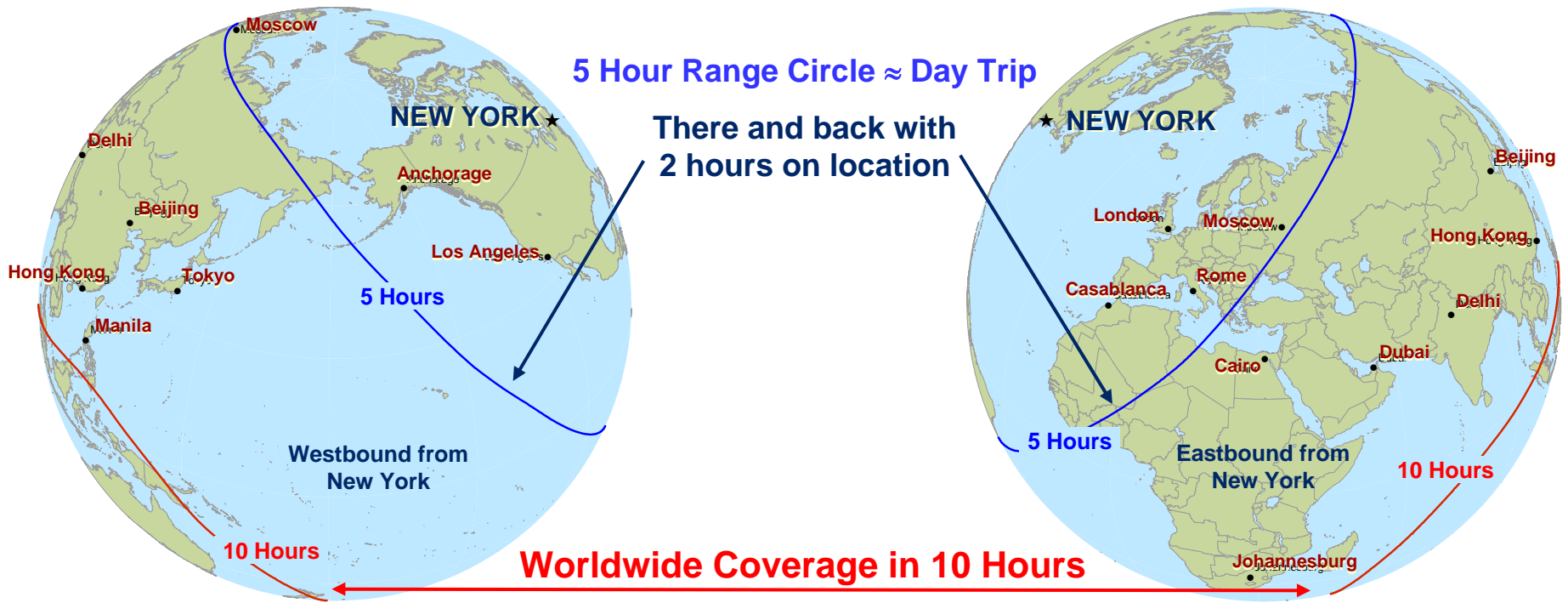
- **Advantages**

- **Smaller Aircraft** → **Reduced Sonic Boom**
- **Lower Speed** → **Less Complexity (Inlets, Materials, Etc.)**



Better Chance at Enabling Acceptable Supersonic Civil Aircraft

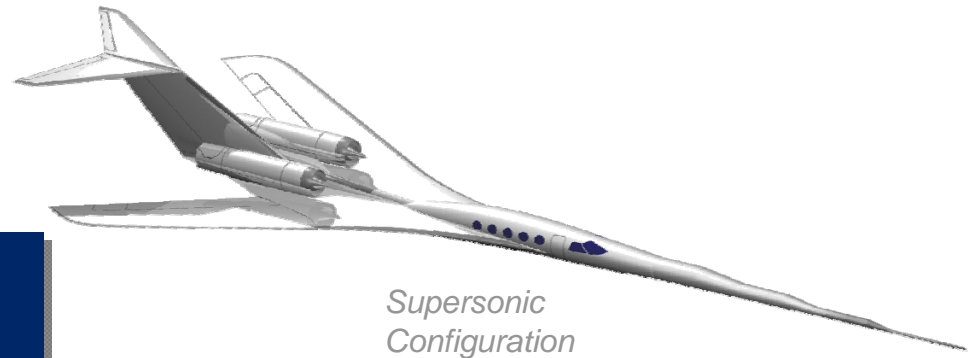
Redefining the Speed Envelope



* Assumes Mach 1.8 over land, 4,800 nm range capability

† CFR Part 91.817 explicitly prohibits aircraft operation in US airspace at flight speeds $>$ Mach 1

**Supersonic Overland Is Key –
Requires Regulatory Change**



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Redefining the Speed Envelope



Cruise Speed 0.90 M



1.80 M

Environmental Considerations

Requirement

- Boom Overpressure
- Takeoff Emissions
- Cruise Emissions
- Airport Noise

Acceptable for Overland SS Flight

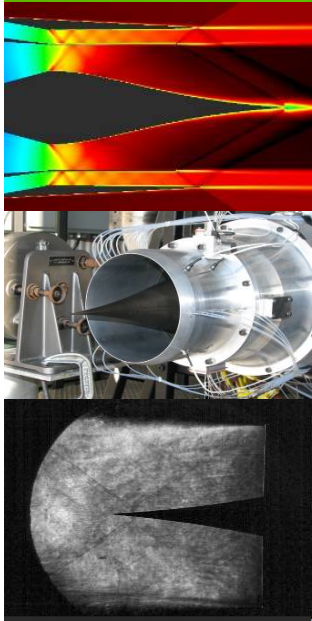
ICAO with Margin

Minimum Impact

Stage 4 with 10dB Margin

Manage Environmental Impacts Through Design Requirements

Supersonic Technology Development



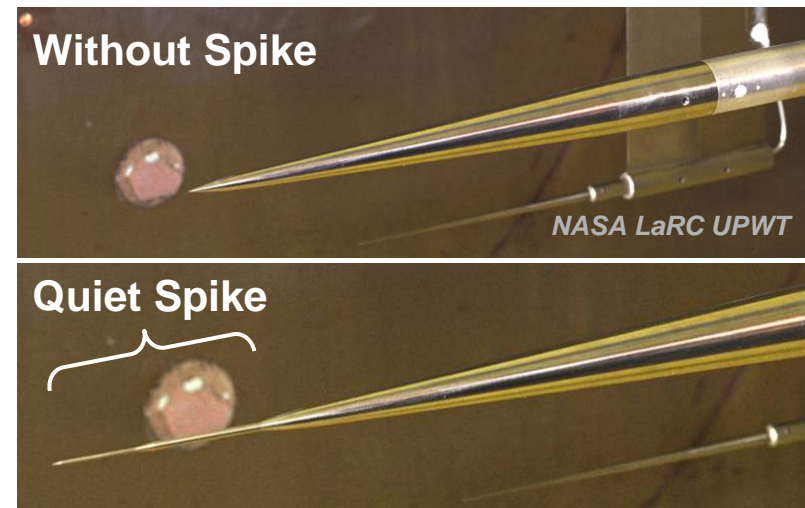
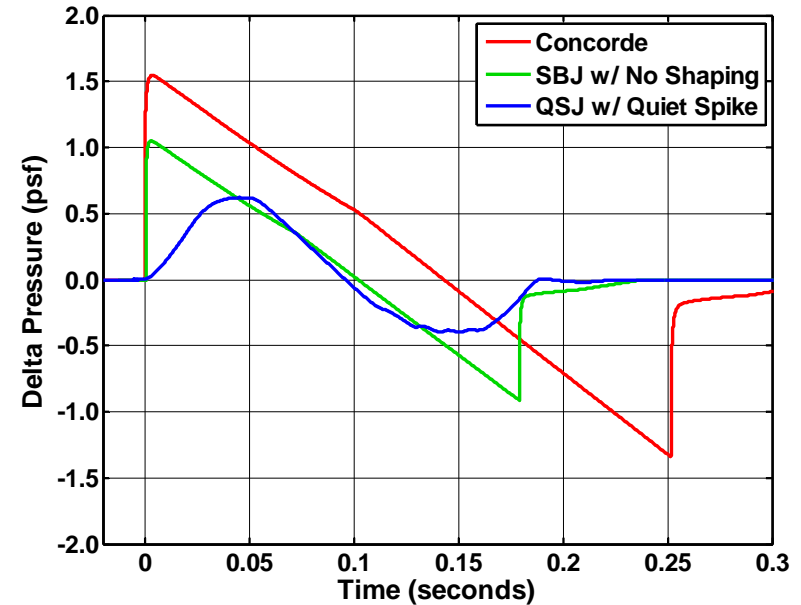
Objective: Conduct basic research into reducing the impact of sonic boom on people and the environment to enable regulatory change for supersonic flight overland, domestically and internationally



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Sonic Boom Suppression

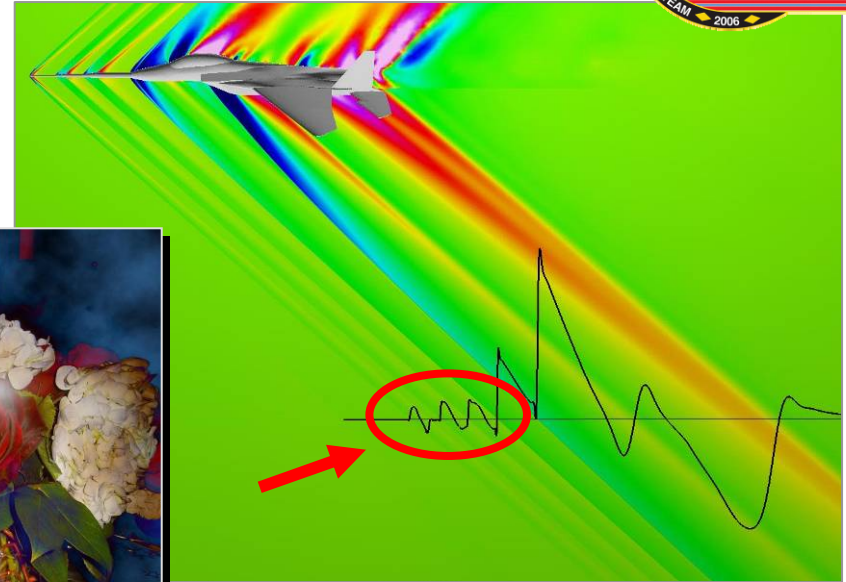
- **Gulfstream Quiet Spike™**
 - Extendable Nose Spike
 - Generate Series Of Weak Shocks
 - Propagate Parallel To Each Other
 - Transform Sharp Crack Into Quiet Whisper



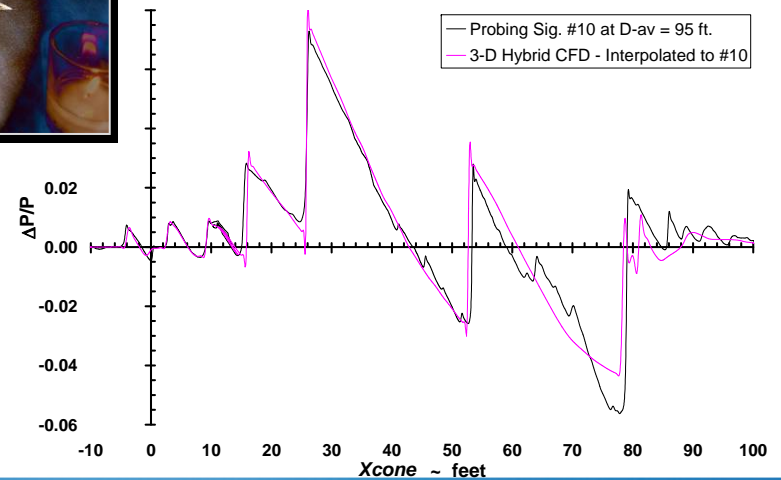
Quiet Spike™ Flight Test



2008 Laureate Award
Aviation Week & Space Technology



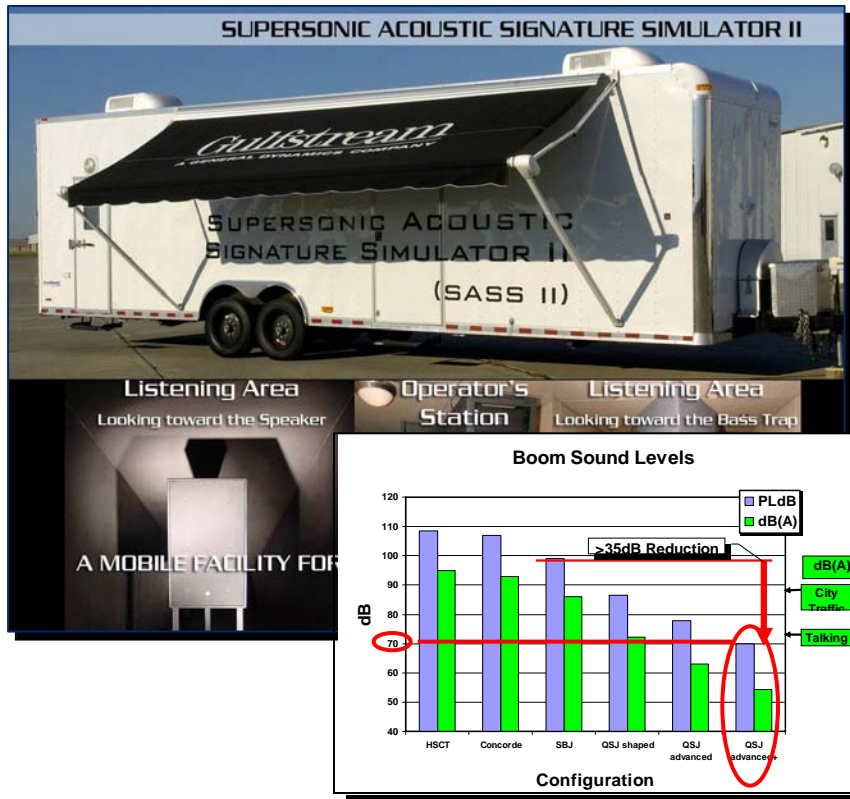
Comparison of CFD-Predicted vs. Measured Near-field Signature



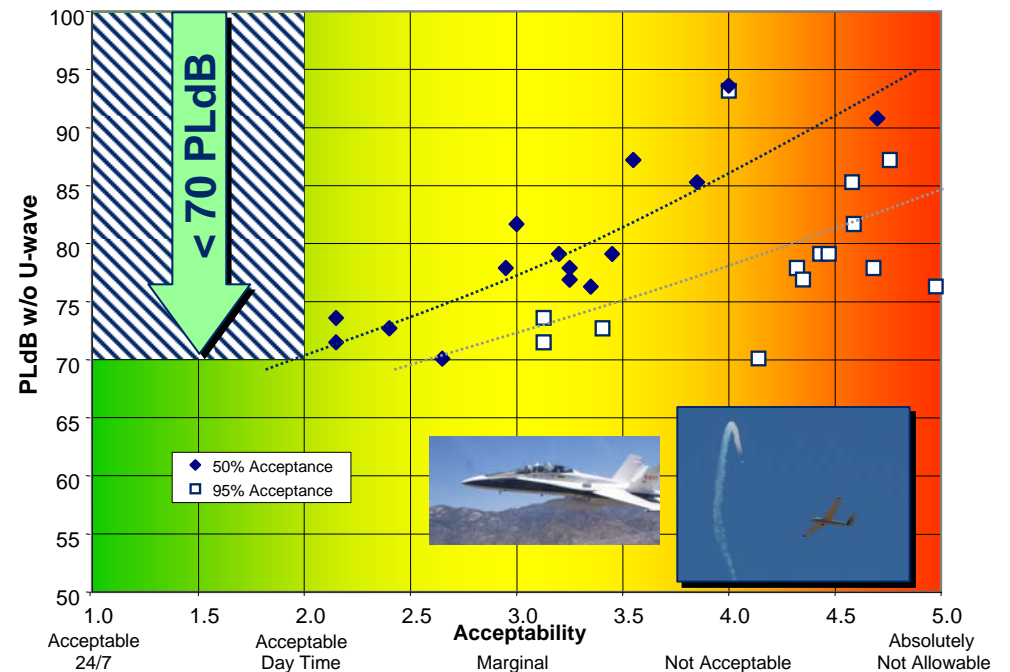
Excellent Correlation & Flight
Validation of Sonic Boom Suppression

Preliminary Outdoor Loudness Assessment

Gulfstream Signature Development & Simulation

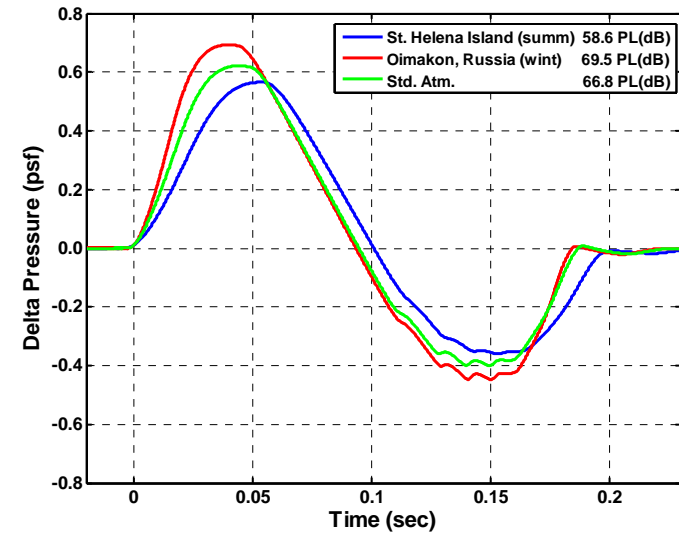
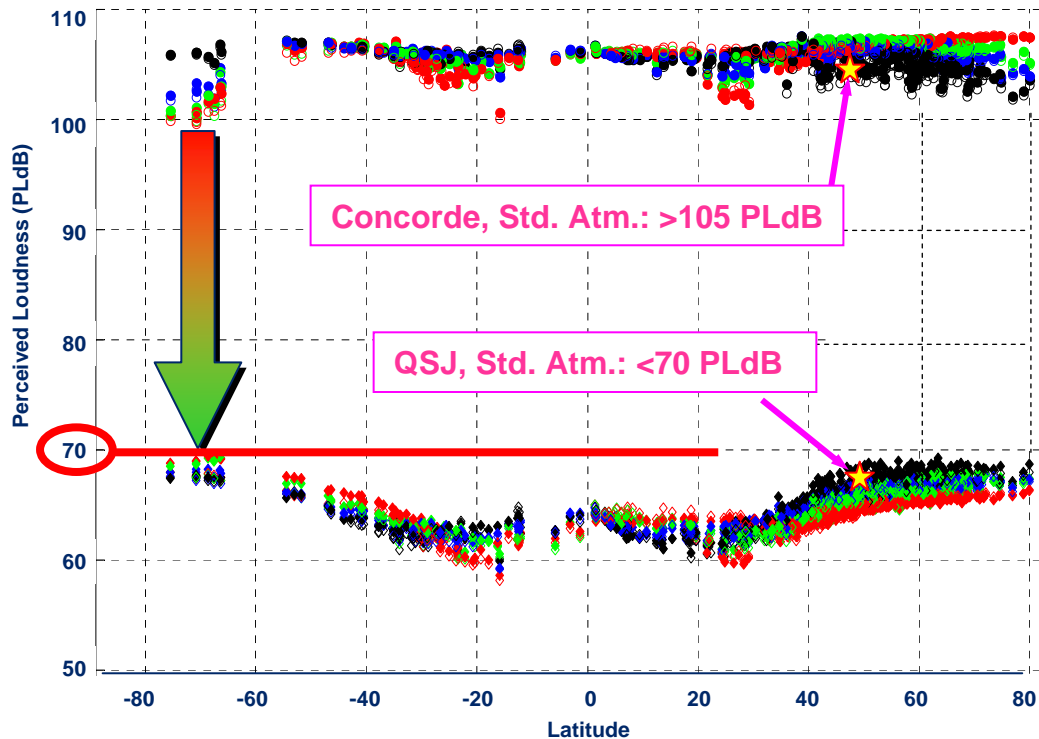


NASA F-18 Low Boom Flight Test – October 2005

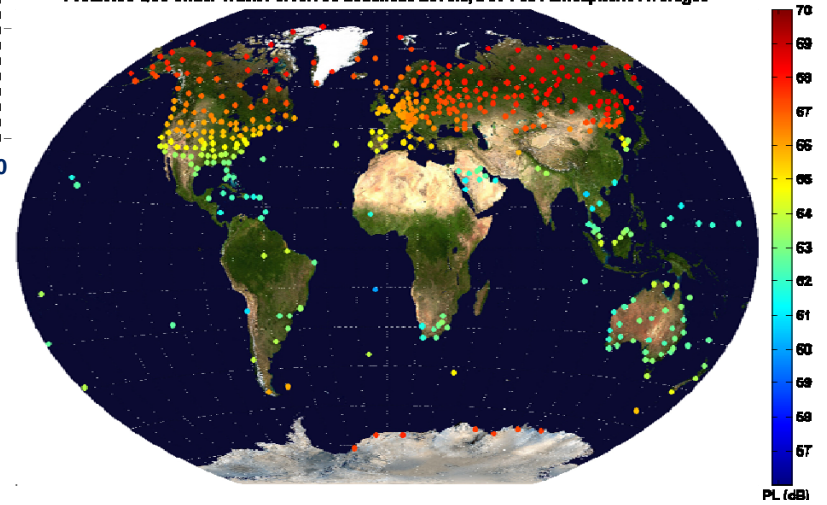


Low Boom Simulation & Preliminary Flight Results Independently Point Toward Signature Levels ~ 70 PLdB

Global Impact Assessment



Predicted QSJ Under Track Perceived Loudness Levels, Dec-Feb Atmospheric Averages



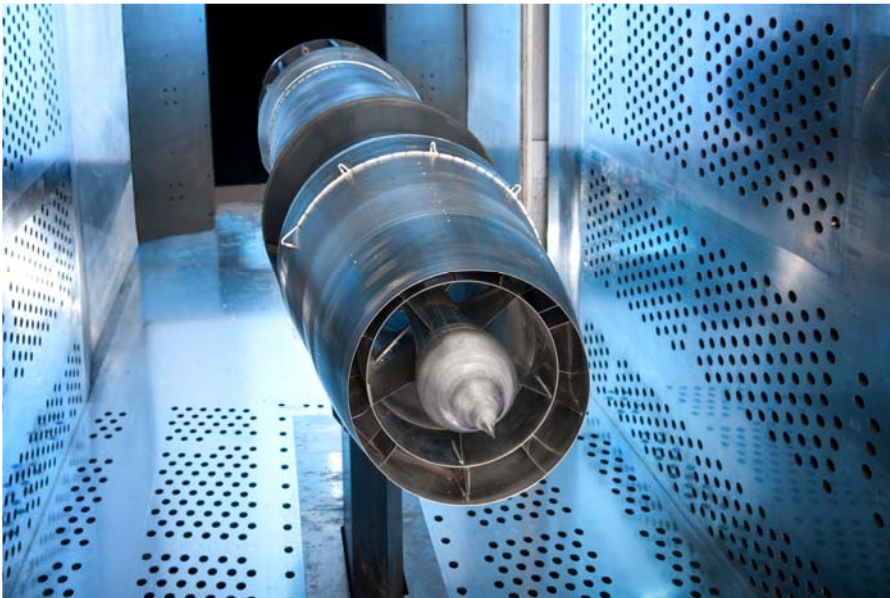
**Low Boom Signature
Robust in Non-Standard
Atmosphere**

Partnering For Quiet Supersonic Flight



Pioneering Low Boom Supersonic Research

Key Scientific & Regulatory Partnerships



Innovative Low Boom Propulsion Development & Testing



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Summary

- **Continued Market / Industry Interest in Future Supersonic Concepts**
 - **Supersonic Overland Flight is Required**
 - **Manage Environmental Design Requirements for Success**
- **Promising Research Results in Sonic Boom Suppression**
 - **Validated Quiet Spike Technology**
 - **Acceptable Noise Level Achieved Through Low Boom Shaping**

Quiet Spike Video



Questions ?



Listening Area

Looking toward the Speaker



Operator's Station



Listening Area

Looking toward the Bass Trap



A MOBILE FACILITY FOR ASSESSING SIGNATURE ACCEPTABILITY